APPENDIX 8: DOCUMENTATION REQUIREMENTS

DATA REQUIREMENTS LIST INSTRUCTIONS

(1) **DRL/DRD ITEM NO. –** Item number of each documentation item or category of items required to be submitted to the Government.

(2) **REFERENCE PARAGRAPH:**

WORK STATEMENT – The paragraph number where the DRL item is referenced in the Statement of Work.

OTHER – Other documents where the DRL item is referenced.

(3) **DOCUMENT** – Title of the documentation item to be submitted.

PRELIMINARY – The document shall be as complete and detailed as possible at the time of submittal.

FINAL – The document shall be complete, fully detailed, and include revisions resulting from the Government review cycle at the time of submittal.

(4) **SUBMIT TO NASA** – Due date for submittal of the item to the Government.

(5) **UPDATING BY CONTRACTOR** – Frequency of submittals after initial submittal. "As Required" is defined as the frequency necessary to maintain the validity of the document.

(6) **DISTRIBUTION:**

TYPE – Electronic text documents shall be in MS Office 2000 or higher format.
P – Unbound printed paper copy.
E – Electronic file copy on mutually-agreed upon medium.

QUANTITY – The number of copies to each recipient noted below, sent to Langley Research Center, Hampton, VA 23681-2199. When the Contracting Officer (**B**) is not designated as a recipient, the Contractor shall furnish a copy of the document transmittal letter to the Contracting Officer.
A – Contracting Officer's Technical Representative, MS 353X
B – Contracting Officer, MS 126
C – According to instructions on DRD
D – Industrial Property Office, MS 377
E – Small Business Specialist, MS 144

(7) **NASA ACTION REQUIRED:**

INFORMATION – No action required.

REVIEW –Review required. The Contractor may implement the document if not notified of corrective actions within two weeks after receipt by the Government. If corrective actions are identified, their resolution shall be mutually agreed upon.

APPROVAL – Approval required. The Contractor shall not implement the document until Government approval is granted in writing.

DATA REQUIREMENTS LIST								
(1) DRL/DRD ITEM NO	(2) REFERENCE PARAGRAPH		(3) DOCUMENT	(4) SUBMIT TO NASA	(5) UPDATING BY CONTRACTOR	(6) DISTRIBUTION		(7) NASA/LaRC ACTION REQUIRED
	WORK STATEMENT	OTHER				TYPE	QTY	
1.			Project Management Plan	45 Days After Effective Date of Contract	As Required	P, E	A - 1	Approval
2.			Technical Status Reports	Monthly: 10 Working Days After Close of Accounting Month	N/A	E	A - 1 B - 1	Information
3.			Project Schedule and Logic Network Reports	Monthly: 10 Working Days After Close of Accounting Month	N/A	E	C	Information
4.			Financial Management Reports	Initial (Baseline): 30 Days After Effective Date of Contract	As Required	P	C	Review
				Monthly 533: 10 Working Days After Close of Accounting Month	N/A	P	C	Information
				Monthly EVM Report: 10 Working Days After Close of Accounting Month	N/A	P	C	Information
				Quarterly 533: Per NPD 9501.1G	N/A	P	C	Information
5.			Product Assurance Plan	90 Days After Effective Date of Contract	As Required	P, E	A - 1	Approval

DATA REQUIREMENTS LIST								
(1) DRL/DRD ITEM NO	(2) REFERENCE PARAGRAPH		(3) DOCUMENT	(4) SUBMIT TO NASA	(5) UPDATING BY CONTRACTOR	(6) DISTRIBUTION		(7) NASA/LaRC ACTION REQUIRED
	WORK STATEMENT	OTHER				TYPE	QTY	
6.			Product Assurance Status Reports	Monthly: 10 Working Days After Close of Accounting Month	As Required	E	A - 1 B - 1	Information
7.			NASA Property in Custody of Contractor Report (NF 1018)	Annually: By October 31 and at End of Contract	Annually	P	B - 1 D - 1	Information
8.			Subcontracting Reports	In Accordance with Instructions on Forms	N/A	P	B - 1 E - 1	Information
9.			New Technology Report	As Required by NFS 18-52-227-70	N/A	P, E	C	Information
10.			Risk Management Plan	45 Days After Contract Award	As Required	P, E	A-1	Approval
11.			DV, Adapter, and GSE Operational Procedures	Preliminary: 30 Days Prior to CDR Final: 30 Days Prior to Delivery	As Required As Required	E P, E	A - 1 A - 2	Review Review
12.			DV and Adapter System Derived Requirements and Performance Specification Document	Preliminary: 45 Days Prior to PDR Final: 45 Days Prior to CDR	As Required As Required	E P, E	A - 1	Review Approval
13.			DV and Adapter Instrumentation Requirements Document	45 Days Prior to PDR	As Required	E	A - 1	Review
14.			DV-to-Adapter Interface Control Document	30 days prior to PDR 30 days prior to CDR	As Required	E	A-1	Information Information

DATA REQUIREMENTS LIST								
(1) DRL/DRD ITEM NO	(2) REFERENCE PARAGRAPH		(3) DOCUMENT	(4) SUBMIT TO NASA	(5) UPDATING BY CONTRACTOR	(6) DISTRIBUTION		(7) NASA/LaRC ACTION REQUIRED
	WORK STATEMENT	OTHER				TYPE	QTY	
15.			DV and Adapter Data Measurements & Analysis Document	Preliminary: 30 Days Prior to PDR Final: 30 Days Prior to CDR	N/A As Required	E P, E	A - 1 A - 1	Review Approval
16.			DV, Adapter, and GSE Shipping and Storage Document	60 Days Prior to Delivery	As Required	E	A - 1	Review
17.			DV/Adapter Spare Parts Document	Preliminary: 30 Days Prior to PDR Final: 30 Days Prior to CDR	As Required	E P, E	A-1	Review Approval
18.			End Item Data Package	With Delivery of Each DV, Adaptor, and GSE	As Required	E	A - 1	Information
19.			Project Review Packages	15 Days Prior to the Specific Review	N/A	P, E	A - 2	Information
20.			Mass Properties Control Plan	Preliminary: 60 Days After Contract Award	As Required	P, E	A-1	Approval
21.			Trade Study Reports	As Available; No Later Than 60 Days Prior to PDR	As Required	E	A - 1	Information
22.			DV-to-Adapter Assembly and Integration Procedure	30 Days Prior to SAR	As Required	E	A-1	Review
23.			DFRC Equipment & Facilities Required by DV, Adapter, and GSE	90 Days After Effective Date of Contract	As required	E	A-1 B-1	Review

DATA REQUIREMENTS LIST								
(1) DRL/DRD ITEM NO	(2) REFERENCE PARAGRAPH		(3) DOCUMENT	(4) SUBMIT TO NASA	(5) UPDATING BY CONTRACTOR	(6) DISTRIBUTION		(7) NASA/LaRC ACTION REQUIRED
	WORK STATEMENT	OTHER				TYPE	QTY	
24.			DV, Adapter, and FCE Verification and System Integration Plan	Preliminary: 30 Days Prior to CDR Final: 30 Days Prior to Demonstrator Vehicle Delivery	As Required N/A	P, E P, E	A – 1 A - 1	Approval Approval
25.			Test Procedures	21 Days Prior to Test	N/A	E	A - 1	Information
26.			Test Reports	Within 30 Days After Test	N/A	E	A - 1	Information
27.			Booster Interface Requirements and Description Document	Submit at Delta SRR	As Required	P, E	A-1	Approval
28.			DV-to-Range Interface Requirements and Description Document	30 days prior to PDR	As Required	P, E	A-1	Approval
29			Software Development Plan	90 Days After Effective Date of Contract	As Required	P, E	A-1 C	Approval
30			Software Requirements Description	Incremental delivery as scheduled in Contractor's SDP	As Required	E	C	Review
31			Software Architecture Description	Incremental delivery as scheduled in Contractor's SDP	As Required	P	C	Review

DATA REQUIREMENTS LIST								
(1) DRL/DRD ITEM NO	(2) REFERENCE PARAGRAPH		(3) DOCUMENT	(4) SUBMIT TO NASA	(5) UPDATING BY CONTRACTOR	(6) DISTRIBUTION		(7) NASA/LaRC ACTION REQUIRED
	WORK STATEMENT	OTHER				TYPE	QTY	
32			Software Design Description	Incremental delivery as scheduled in Contractor's SDP	As Required	E	C	Review
33			Software Interface Design Description	Incremental delivery as scheduled in Contractor's SDP	As Required	E	C	Review
34			Software Integration, Test, and Verification Plan	30 Days prior to CDR	As Required	E, P	A-1 C	Approval
35			Software Verification Test Procedures	21days prior to test	As Required	E	C	Review
36			Software Verification Test Results Report	30 days following test	As Required	E	A-1 C	Information
37			Software Validation Recommendations	7 days prior to Validation TRR.	As Required	E	A-1 C	Information
38			Software Status Report	Monthly: 10 Days After Close of Accounting Month	As Required	E	A-1 C	Information
39			DV Separation Development Plan	3 months after contract award	Quarterly	E, P	A-1	Approval
40			DV Emulator Definition	30 Days Prior to PDR	As Required	E, P	A-1	Approval
41			Flight Software	Incremental delivery as scheduled in Contractor's SDP	As Required	E	C	Review
42			Software Data Distribution System Master Listing	Quarterly – 10 Days after Close of Accounting Quarter.	As Required	E	A-1 C	Information

DATA REQUIREMENTS LIST								
(1) DRL/DRD ITEM NO	(2) REFERENCE PARAGRAPH		(3) DOCUMENT	(4) SUBMIT TO NASA	(5) UPDATING BY CONTRACTOR	(6) DISTRIBUTION		(7) NASA/LaRC ACTION REQUIRED
	WORK STATEMENT	OTHER				TYPE	QTY	
43.			DV Emulator Documentation	Incremental delivery with components Final item to be received no later than 6 months prior to DV delivery	As Required	E E	C C	Information Review
44			DV Emulator Core Component Documentation	Initial HW documentation delivery – 4 months following PDR Initial SW documentation delivery – incremental per SW Development Plan	As Required As Required	E	C	Review
45			DV Controller Design Description Document	3 months prior to PDR	Quarterly	E	A-1	Review
46			Model Description Documentation	Incremental delivery as scheduled in Contractor's SDP Final item to be received no later than 3 months after CDR.	As Required	E	C	Review
47			Reference Trajectory	Initial: 45 days after Effective Date of Contract Preliminary: 30 Days prior to PDR Final: 30 Days prior to CDR.	As Required	P, E P, E P, E	A-1	Approval Approval Approval
48			Separation Simulation	Preliminary: 3 Months prior to CDR. Final: 3 Months after CDR	As Required	E	C	Information

DATA REQUIREMENTS LIST								
(1) DRL/DRD ITEM NO	(2) REFERENCE PARAGRAPH		(3) DOCUMENT	(4) SUBMIT TO NASA	(5) UPDATING BY CONTRACTOR	(6) DISTRIBUTION		(7) NASA/LaRC ACTION REQUIRED
	WORK STATEMENT	OTHER				TYPE	QTY	
49			DV Simulation	Preliminary: 3 Months prior to CDR. Final: 3 Months after CDR	As Required	E	C	Information
50			Simulation Reconciliation Report	15 Days after Completion of Reconciliation	As Required	E	C	Review
51			Validation Recommendations	15 Days Prior to Validation TRR.	As Required	E	A-1	Information
52			Post-Flight Test Evaluation	30 Days After Completion of Flight Test	As Required	E	A-1	Information
53.			Structural Loads Development Plan	90 Days After Effective Date of Contract	As Required	P, E	A-1	Approval
54.			Structural Loads Definition Document	Preliminary: 30 Days Prior to PDR Final: 30 Days Prior to CDR.	As Required	E	A-1	Review Review
55.			DV/Adapter Structural and Thermal FEA Models	Preliminary: 30 Days Prior to PDR Final: 30 Days prior to CDR.	Quarterly	E	A-1	Review
56.			PS Performance and Operability Characterization Plan	45 Days After Effective Date of Contract	As Required	P, E	A-1	Approval
57.			PS Analytical Model	Preliminary: 30 Days Prior to PDR Final: 30 Days prior to CDR.	As Required	E	A-1	Review

DATA REQUIREMENTS LIST								
(1) DRL/DRD ITEM NO	(2) REFERENCE PARAGRAPH		(3) DOCUMENT	(4) SUBMIT TO NASA	(5) UPDATING BY CONTRACTOR	(6) DISTRIBUTION		(7) NASA/LaRC ACTION REQUIRED
	WORK STATEMENT	OTHER				TYPE	QTY	
58.			PS Monte Carlo Analysis	Preliminary: 30 Days prior to PDR Final: 30 Days prior to CDR.	As Required	E	A-1	Review
59.			PS Cleanliness and Contamination Control Plan	CDR	As Required	P, E	A-1	Approval
60.			PS Design Criteria	Preliminary: 30 Days prior to PDR Final: 30 Days prior to CDR.	As Required	E	A-1	Review
61.			PS Operational Envelope	Initial: 45 days after Effective Date of Contract Preliminary: 30 Days prior to PDR Final: 30 Days prior to CDR.	As Required	E	A-1	Review
62			FCE Software Documentation	Preliminary: 30 Days prior to FCE PDR Final: 30 Days prior to FCE CDR.	As Required	E	A-1	Review
63			FCE-to-8-Ft. HTT Interface Control Document	Preliminary: 30 Days prior to FCE PDR Final: 30 Days prior to FCE CDR.	As Required	P, E	A-1	Approval

DATA REQUIREMENTS LIST								
(1) DRL/DRD ITEM NO	(2) REFERENCE PARAGRAPH		(3) DOCUMENT	(4) SUBMIT TO NASA	(5) UPDATING BY CONTRACTOR	(6) DISTRIBUTION		(7) NASA/LaRC ACTION REQUIRED
	WORK STATEMENT	OTHER				TYPE	QTY	
64			FCE and GSE Operational Procedures	Preliminary: 30 Days prior to FCE CDR Final: 30 Days prior to FCE Delivery	As Required	E P, E	A-1	Review Approval
65			FCE Model Systems Report	30 Days prior to FCE CDR.	N/A	P, E	A-1	Approval
66			Verification Reports	Within 30 Days After Test	N/A	E	A-1	Information
67			Integrated Aero/Propulsion Model Methodology and Plan	45 Days After Contract Award	As Required	P, E	A-1	Approval

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Project Management Plan	1
3. USE	**4. DATE**
Provides a description of the management organization and methods by which the Contractor will assure compliance with the contractual tasks.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**
Technical Status Reports (DRD-2), Project Schedule and Logic Network Reports (DRD-3), Financial Management Reports (DRD-4)	

9. PREPARATION INFORMATION

Shall contain the contract management plan, establishing the Contractor's organizational structure and overall methodology for initiation, control, and implementation of the tasks necessary to complete the total effort.

At a minimum, the plan shall address:

- Corporate organization and flow down to project organization
- CWBS and Dictionary
- Staffing plan and key personnel identified for the total program
- Control over essential resources and functions to accomplish the work
- Process of resolving resources priority conflicts when beyond control of the Project Manager
- Management approach/techniques to minimize costs and schedule impacts (includes subcontractors and suppliers)
- Management approach to problem avoidance and/or solution
- Facilities required and the scheduling thereof
- Risk management strategy
- Establishment and control of performance measurement baselines
- Management reserve
- Resource budgets
- Schedules
- Work packages
- Management of Subcontracts

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Technical Status Reports	2
3. USE Provides data on Contractor activity and progress toward contract objectives.	**4. DATE** January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP Project Management Plan (DRD-1), Project Schedule and Logic Network Reports (DRD-3), Financial Management Reports (DRD-4)	**8. REFERENCES**

9. PREPARATION INFORMATION

Shall contain data sufficient to assess the status of all contract technical activities.

Shall include, but is not limited to:

- Status of the overall project, including:
  - Progress towards near-term milestones
  - Milestones achieved
  - Identification of milestones to be achieved in the next reporting period
  - Critical Paths
  - Risk Management Status
- Technical status organized by product-oriented CWBS
- Summary of new System Engineering Reports
- Mass Properties Report
- Margin report & reconciliation: mass, power, fuel, data bandwidth, CPU/memory usage, and other parameters required for reporting to the Government.
- Summary and status of new and open Trade Studies, and summary of newly closed Trade Studies
- Summary of problems encountered, including:
  - Failure reports
  - Corrective actions planned/taken
  - Closure summaries
- Drawing status, and list of new drawings

The Contractor shall provide access to selected System Engineering Reports, Trade Study Reports, and drawings upon request.

While generally not required, the Contractor may be requested to provide informal technical status reporting via email more frequently than is specified in the Data Requirements List.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Project Schedule and Logic Network Reports	3

3. USE	4. DATE
Provides the Contractor's schedule, activity sequences, and interrelationships of the tasks to be performed. Provides progress information, trend analysis, critical path assessment, and serves as a basis for other reviews and performance evaluations.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager

7. INTERRELATIONSHIP	8. REFERENCES
Project Management Plan (DRD-1), Technical Status Reports (DRD-2), Financial Management Reports (DRD-4)	

9. PREPARATION INFORMATION

Shall document the Contractor's time-phased plan for completing the total contracted scope of work. Schedules shall contain the approved baseline schedule, as well as current forecasted dates (if different), and shall be traceable to the Contract Work Breakdown Structure (CWBS).

Shall contain:

- Project Master Schedule
- Intermediate Schedules
- Logic Network Database
- Contractor Schedule Assessment Report

The data contained in each of the above shall be consistent with and based on the Contractor's accounting period monthly cutoff date. Content and definition are provided in the following paragraphs.

Project Master Schedule

Shall be a one page, top-level, Gantt-type summary document arranged by CWBS that contains:

- Identification of major project phases
- Contract and controlled milestones
- End-item delivery dates

Intermediate Schedules

Shall be Gantt-type summary documents arranged by CWBS. Detail shall be provided to CWBS Level 3 with lower level detail provided as requested by the Government. Shall contain, at a minimum:

- Identification of major project phases
- Contract and controlled milestones
- Important subcontractor milestones
- End-item delivery dates
- Critical path identification

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DATA REQUIREMENTS DESCRIPTION, CONTINUED

1. TITLE	4. DATE	2. NUMBER
Project Schedule and Logic Network Reports	January 30, 2003	3 (cont.)

9. PREPARATION INFORMATION

Logic Network Database

Shall contain schedule data for all CWBS elements. The entire scope of work shall be broken into schedule tasks and milestones at a consistent level of detail to allow discrete progress measurement and visibility into each end-item deliverable. Additionally, all schedule tasks and milestones shall be integrated with the appropriate sequence relationships to provide a total end-to-end logic network leading to each end-item delivery.

Contractor Schedule Assessment Report

Shall contain, at a minimum:

- Trend analysis of weeks ahead/behind for each WBS Level 3 element
- Primary and secondary critical path narratives
- Variance and impact statements for contract/controlled milestone variances
- Work-around plans for critical path and potential critical paths that are behind schedule

Report shall explain the variances and shall reconcile to the variance analysis submitted with the Critical Path Report (No Criteria).

On an exceptional basis, the Contractor may be requested to provide more frequent and more in-depth schedule status reporting for CWBS subdivisions of work determined by the Government to be critical.

Submission of the schedule reports shall be as follows:

- COTR (M/S 353X): One copy of the Master Schedule, Intermediate Schedule, and Contractor Schedule Assessment Report.
- Schedule Analyst (M/S 353X): One copy of the Master Schedule, Intermediate Schedule, Logic Network Database, and Contractor Schedule Assessment Report.
- Contracting Officer (M/S 126): Cover letter only.

NASA Langley Form 45A (August 1988)

DATA REQUIREMENTS DESCRIPTION	
1. TITLE Financial Management Reports	2. NUMBER 4
3. USE Provides a measure of the cost performance of the contract.	4. DATE January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP Project Management Plan (DRD-1) Technical Status Reports (DRD-2) Project Schedule and Logic Network Reports (DRD-3)	8. REFERENCES

9. PREPARATION INFORMATION

Baseline Budget

The Contractor shall submit the initial integrated time-phased baseline budget in accordance with the product-oriented CWBS. The Contractor shall coordinate plans regarding baseline revisions with the Government prior to effecting the change. The Contractor's financial management reporting shall be prepared in accordance with NPD 9501.1G and the paragraphs herein.

Financial Reports

1. The Contractor shall submit the following Financial Reports:

   A. Monthly Contractor Financial Management Report, NASA Form 533M or equivalent. Each report shall include a narrative explanation for variances exceeding +/- 5% between estimated dollars shown in the prior month and actual dollars shown in the current month at the contract level. The reporting level shall be CWBS Level 3 and shall use the elements of cost listed in Paragraph 3.

   B. Quarterly Contractor Financial Management Report, NASA Form 533Q or equivalent. The reporting level shall be CWBS Level 3 and shall use the elements of cost listed in Paragraph 3.

   C. Monthly Earned Value Management Report (EVMR). The report shall be completed in accordance with the Contractor's approved earned value system. Reporting shall be to Level 3. Include cost variance analysis for all variances 10% and greater and impacts to the estimate-at-completion (EAC). Variance Analysis Thresholds shall be reviewed periodically and adjusted as appropriate. Cost concern(s) / cost offsets(s) shall be identified and addressed.

2. The data and information provided in each of the above reports shall pertain to all authorized contract work and shall be in accordance with the product-oriented CWBS and contract provisions.

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DATA REQUIREMENTS DESCRIPTION, CONTINUED

1. TITLE	4. DATE	2. NUMBER
Financial Management Reports	January 30, 2003	4(cont.)

9. PREPARATION INFORMATION

3. Financial reports shall contain the following Elements of Cost
   - Direct Labor Hours (by discipline/function, e.g., engineering, manufacturing, etc.)
   - Direct Labor Dollars (by discipline/function, e.g., engineering, manufacturing, etc.)
   - Labor Overhead (by discipline/function, e.g., engineering, manufacturing, etc.)
   - Material
   - Material Burden
   - Subcontracts (subcontracts over $100K must be listed separately)
   - Other Direct Cost (ODC)
   - General and Administrative (G&A)
   - Cost of Facilities Capital
   - Subtotal (excluding reserve)
   - Management Reserve (to be reported at lowest applicable CWBS level when used)
   - Total Contract Cost
   - Fee (To be reported at CWBS Level 1 only)
   - Total Cost plus Fee (To be reported at CWBS Level 1 only)

4. Special Instructions
   A. The Contractor Narrative Remarks submitted with the 533M (or equivalent) shall include the pricing basis for direct and indirect costs in the initial report. Changes thereto shall be reported in the first report reflecting the change, as well as the impact of such change. In the event that significant change(s) in the pricing basis for direct or indirect costs are anticipated, the potential dollar impact of anticipated change(s) shall be identified as a cost concern or offset. Changes to the baseline and management reserve shall be fully explained in the monthly narrative reporting.

   B. The Contractor shall indicate the estimated cost for the two successive months following the month of the report in Columns 8a and 8b. The Contractor shall provide a fiscal year breakdown of the estimated cost for the balance of the contract that is entered in 8c.

   C. The Contractor shall include the Unfilled Orders Outstanding in the 533M reporting, Column 10 and in the 533Q reporting, Column 11.

   D. The NASA Form 533 series of reports (or equivalent) shall be used to obtain cost data from major cost-reimbursement type subcontracts (or inter-divisional transfers) which meet the reporting criteria in NPD 9501.1G, following the same reporting procedures specified herein. The subcontractor reports shall be included as attachments to the prime's 533 reports as applicable. In cases where cost data is proprietary or of a competition-sensitive nature, subcontractors may provide cost element breakdown detail directly to Government.

NASA Langley Form 45A (August 1988)

E. Financial reports may be submitted electronically to designated recipients, provided Contractor's systems/applications/file formats are compatible with Government. A hard copy is also required.

5. Quick-Look Reports may be requested to provide supplementary information. Generally, the reports specified above will be the maximum required.

6. The report distribution shall be as follows:
   - COTR (M/S 353X): One copy of the Initial Baseline Report, 533M & Q Reports (including Subcontractor Financial Reports), and EVMR.
   - Resource Analyst (M/S 353X): One copy of the Initial Baseline Report, 533M & Q Reports (including Subcontractor Financial Reports), and EVMR.
   - Cost Accounting (M/S 135): One copy of the 533M & Q Reports.
   - Contracting Officer (M/S 126): One copy of the 533M & Q Reports. Cover letter only for Initial Baseline Report and EVMR.

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Product Assurance Plan	5
3. USE	4. DATE
Provides the plan for implementing a mission assurance program.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	8. REFERENCES
Project Management Plan (DRD-1)	

9. PREPARATION INFORMATION

Shall address, but not be limited to, the following areas as called out in Appendix 6, Product Assurance Requirements:

- Mission assurance program
- Quality assurance plan
- Failure reporting plan
- Parts selection process
- Materials selection process
- Fabrication Inspection Plan
- Fabrication and assembly control process
- Reliability program
- Contamination control program
- Configuration management system
  - Critical Item Definition and Listing
- System Safety Plan
- Safety documentation plan
- DV, Adapter, and GSE transportation and storage assurance plan
- Environmental review support

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Product Assurance Status Report	6
3. USE	**4. DATE**
Provides a monthly report reporting the Contractor's progress in all areas of Product Assurance required by the SOW.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**
Product Assurance Plan (DRD-5) Risk Management Plan (DRD-10)	

9. PREPARATION INFORMATION

Shall address, but not be limited to, the following areas including those called out in Appendix 6, Product Assurance Requirements:

- Status of all Product Assurance tasks
- Deficiencies that could affect the end item product, the cause of the deficiency, and corrective actions taken
- Compliance substantiation for previously designed, fabricated, and flown hardware and/or software
- All Non-Conformance Reports (NCR's)
- Nonstandard Part Approval Request (NSPAR)
- Limited Life Articles List
- Nonconformance Status List
- Failure Modes and Effects Analysis (FMEA)
- Fault tree analyses
- Risk management identification, analysis, planning, tracking, and mitigation
  - This information is also input into STIN on a monthly basis.

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
NASA Property in Custody of Contractor Report (NF 1018)	7
3. USE	**4. DATE**
Provides status of all Government-owned / Contractor-held property that has been furnished to or acquired by the Contractor under the terms of this contract.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES** NFS 18-52.245-73

9. PREPARATION INFORMATION

The Contractor shall prepare and distribute NASA Form 1018 in accordance with NFS 18-52.245-73.

NASA Langley Form 45 (August 1988)

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Subcontracting Reports	8
3. USE Provides subcontract data on Federal contractors that are required to establish plans for subcontracting with small disadvantaged business concerns.	**4. DATE** January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

The Contractor shall submit Standard Form 294, Subcontracting Report for Individual Contracts, and Standard Form 295, Summary Subcontractor Report, in accordance with the instructions on the reverse of the forms.

In addition to the instructions on the reverse of the SF 295, the Contractor shall comply with Clause 1852.219-75, Small Business Subcontracting Reporting.

NASA Langley Form 45 (August 1988)

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
New Technology Report	9
3. USE	**4. DATE**
Provides technical information concerning inventions, discoveries, improvements and innovations made by the Contractor in the performance of work under this contract. Also provides data to review for possible patentable items.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES** NFS 18-52.227-70

9. PREPARATION INFORMATION

Interim New Technology Report - After the first anniversary date of the contract, the Contractor shall submit an annual list of reportable items, certify that all reportable items have been disclosed (or that there are no such inventions), and certify that the procedures required by paragraph (e)(1) of the New Technology clause have been followed as set forth in NFS 1852.227-70. This report is due by March 31 of each year.

Final New Technology Report - The Contractor shall submit a list of reportable items, or certify that that there were no such reportable items, and list all subcontracts at any tier containing a patent-rights clause, or certify that there were no such subcontracts as set forth in NFS 1852.227-70. This report is due within 3 months after completion of the contracted work.

Invention disclosure reporting - The Contractor shall disclose each reportable item under the contract as set forth in NFS 1852.227-70. The electronic or paper version of NASA Form 1679, Disclosure of Invention and New Technology (Including Software), may be used for this reporting. Both the electronic and paper versions of this form may be accessed at http://invention.nasa.gov. Disclosures are required within two months after the inventor discloses it in writing to Contractor personnel who are responsible for the administration of the New Technology clause.

Distribution:

- Contracting Officer, Mail Stop 126
- Contracting Officer's Technical Representative, Mail Stop 353X
- New Technology Representative, Mail Stop 212
- Patent Counsel, Mail Stop 212

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Risk Management Plan	10
3. USE	4. DATE
Describes the methods and tools to be used for continuous risk management	February 19, 2003
	5. PREPARED BY: X43-C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	8. REFERENCES
Project Management Plan (DRD-1) Product Assurance Plan (DRD-5) Product Assurance Status reports (DRD-6)	

9. PREPARATION INFORMATION

This document shall provide a stand-alone risk management plan in accordance with the X43-C Risk Management Plan (0100-02). It shall include, but not be limited to, the following:

- Risk identification
- Analysis
- Planning
- Tracking
- Mitigation information
- Integration of risk management data into STIN

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV, Adapter, and GSE Operational Procedures	11
3. USE	4. DATE
Provides the information necessary to operate the DV and Adapter.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

Shall contain a complete, detailed description of Ground Test, Pre-Flight, Captive Carry, Drop/Boost, Separation, Coast, Engine Test, Descent, and RTB operational procedures for the DV, Adapter, and GSE systems, and all supporting documentation necessary for operation of the system. Contents shall include, but not be limited to:

- Ground test procedures
- Pre-flight checkout procedures
- Ground station and in-flight software operating procedures
- DV and Adapter monitoring procedures, including:
  - Critical parameters to monitor
  - Parameter thresholds and limits
  - Important trends to monitor
  - Operator reaction to out-of-limits parameters
- Fueling/servicing
- Arming of Separation Device
- CAC-monitored operational and safety-related parameters

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV and Adapter System Derived Requirements and Performance Specification Document	12
3. USE	**4. DATE**
Provides a comprehensive specification of the DV and Adapter design, operation, and performance requirements.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

Shall contain functional and performance requirements through all phases of operation for the DV and Adapter systems, design and safety margins, and the derived environment.

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DATA REQUIREMENTS DESCRIPTION	
1. TITLE DV and Adapter Instrumentation Requirements Document	2. NUMBER 13
3. USE Provides derived requirements for instrumentation system design, operation, and performance.	4. DATE January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP X-43C Research Measurements List, Addendum A of Appendix 1, DV Element Requirements	8. REFERENCES

9. PREPARATION INFORMATION

Shall cover location, design, derived environments, margins, Integration and Test constraints and requirements, and calibration and test requirements to occur from assembly through flight.

Shall correlate with the databases developed from wind tunnel testing and computational methods provided by the Government. Shall identify all necessary GSE and the GSE requirements. This specification is intended to form the basis for flight hardware and software design and development.

CONTENTS:

Functional Requirements
1. Electrical
2. Mechanical / Thermal
3. Software
4. Other

Performance Requirements
1. Accuracy
2. Resolution
3. Sample Rate
4. Range

Design Requirements
1. Electrical
2. Mechanical / Thermal
3. Software
4. Other

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DATA REQUIREMENTS DESCRIPTION	
1. TITLE DV-to-Adapter Interface Control Document	2. NUMBER 14
3. USE The DV-to-Adapter ICD specifies the requirements and provides description of the interface between the DV and Adapter. The ICD is used by the Contractor as the basis for development of the interface. The ICD provides the Government with insight into the in-flight DV/Adapter separation mechanism.	4. DATE January 24, 2003 5. PREPARED BY: Kurt Detweiler Chief Engineer 6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

As a minimum, the following sections shall be included in the ICD:

- Structural Interface
  - Joint geometry
  - Fastener specifications
- Mechanical interface
  - In-flight separation mechanism
  - Connectors – type and number
  - Fluid systems
- Thermal interface
  - Temperature limitations
  - Cooling medium flow definition
  - Insulation
  - Heat dissipation
- Electrical interface
  - Power – voltage and current
  - Signal (analog) – type, voltage, polarity, and range
  - Signal (digital) – type, voltage and polarity
- Data Interface
  - Bus type
  - Reference voltage (if applicable)
  - Data rate
  - Latency
  - Protocol

In addition, DV pass-through fluid and electrical connections to the Booster or Carrier Aircraft shall be identified and specified.

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV and Adapter Data Measurements & Analysis Document	15
3. USE	**4. DATE**
Provides the content and format of the DV and Adapter Data as delivered to the Government.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**
X-43C Research Measurements List, Addendum A of Appendix 1, DV Element Requirements	

9. PREPARATION INFORMATION

Shall contain, at a minimum:

- The overall format of the DV and Adapter data as telemetered.
- The format of each major frame or block containing the DV and Adapter data as telemetered.
- A description of each data parameter.
- The format of each data parameter.
- The units associated with each data parameter.
- Scale factors that must be applied to data for conversion to engineering units. (Classified)

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV, Adapter, and GSE Shipping & Storage Document	16
3. USE	**4. DATE**
Provides procedures and requirements for the shipping and storage of the DV, Adapters, spares, and GSE.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

Shall contain, at a minimum:

- Shipping Preparation Procedures
- Shipping and Handling Procedures
- Shipping and Storage Environmental Constraints
- Shipment volume, mass, and contents
- Post-Shipment Unpacking, Inspection, and Test Procedures
- Shipping container disposal plan

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV/Adapter Spare Parts Document	17
3. USE Provides complete listing of required spare parts and materials for the DV and Adapter.	4. DATE January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

Delivery on CD-ROM is preferred.

Shall contain, at a minimum:

- Spare Parts List with following info
  - Part number
  - Part name
  - Production drawing number
  - Assembly and/or layout drawing number if available
  - Number of spares

- Spare Materials List, as applicable- Materials that have long lead times or other issues that may impact their ready availability for repair of Contractor provided hardware that is likely to be damaged (such as TPS)

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
End Item Data Package	18
3. USE Provides cognizance of the design data and functional characteristics required to support long-term operation and configuration accountability of the contract deliverables.	**4. DATE** January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

Delivery on CD-ROM is preferred.

Shall contain, at a minimum:

- Engineering analyses including design margin
  - Thermal analysis with math models and supporting documentation
  - Structural analysis with math models and supporting documentation
  - Reliability analysis
  - Mass properties report and supporting documentation
  - OML configuration including butt gap and surface mismatch from Drop/Boost through Descent Phases
- Margin report & reconciliation: mass, power, fuel, data bandwidth, CPU/memory usage, and other parameters as required.
- Drawings, Drawing Tree, CAD models (*Electrical, Mechanical*)
- Parts and Materials List
- Non-Conformance Reports (NCRs), Nonconformance Failure Reports (NFRs), or equivalent
- Flight Software Source Code
- Software Version Description Document
- DV/Adapter interface descriptions
- Failure Reports, Corrective Actions, and Closure Summaries
- Waivers and Deviations
- Limited Life Articles
- Safety documentation
- Calibration data (classified)
- Total uncertainty measurement of research measurements list
  - Error sources at sensors, wiring, interconnections, and analog-to-digital converters.
  - Error parameters including linearity, hysteresis, sensitivity, repeatability, electrical and process noise, and environmental effects.
  - Data latency for all parameters directly acquired by the Instrumentation Subsystem.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Project Review Packages	19
3. USE	**4. DATE**
Provides information on the content of the formal reviews described in the Statement of Work.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

Project Reviews shall be in accordance with Langley Center Procedure LMS-CP-5505. Shall consist of two parts -- the material distributed prior to the review and the material presented at the review.

The pre-review material shall consist of, at a minimum, items such as:

- Subsystem review reports, as applicable
- Background material, as needed
- Engineering analyses to date
- Mass Properties Report and supporting documentation
- Margin Report & reconciliation: mass, power, fuel, data bandwidth, CPU/memory usage, and other parameters as required.
- Selected electrical and mechanical drawings, as needed
- Thermal and structural math models to date
- Calibration data to date
- Selected software products to date
- Preliminary presentation package

Material shall be of sufficient depth to allow panel members to formulate questions and concerns prior to the review. It is not necessary to distribute a copy of all the schematics, engineering drawings, or software source code.

The presentation package material shall consist of, at a minimum:

- Content specified in the NASA Langley Center Procedure LMS-CP-5505
- Engineering analyses to date
- Margin Report & reconciliation: mass, power, fuel, data bandwidth, CPU/memory usage, and other parameters as required.
- Risk Waterfall Chart and Project Top Ten Risks

Delivery on CD-ROM is preferred.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Mass Properties Control Plan	20
3. USE The objective of this plan shall be to formulate an organized weight control/integration program. Includes DV and Adapter control weight definitions/requirements, allocations, weight contingency, and contingency weight depletion schedule.	4. DATE February 18, 2003
	5. PREPARED BY: Kurt N. Detweiler Chief Engineer
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP Technical Status Reports (DRD-2) Project Review Packages (DRD-19)	8. REFERENCES

9. PREPARATION INFORMATION

Shall address, but not limited to, the following:

- Management oversight
- Mass Properties Limits
  - Booster capabilities
  - Trajectory Performance [Boost and DV Free Flight]
  - Accuracy limits and associated uncertainty analysis
- Mass Growth allowances
- Mass Properties Database
  - Update frequency
  - Detailed mass statement format
    - Integration into mass statement for the Booster/Launch Services Contract LV
- Mass Properties Limits Monitoring/Reporting
  - Monthly status report content
    - To include DV fuel margin upon completion of Engine Test Phase
- Corrective action plans
- Final mass property verification

Reference: Mil-Hdbk-1811, Mass Properties Control for Space Vehicles, 08/12/1998

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Trade Study Reports	21
3. USE	**4. DATE**
To document trade studies that will affect the mission design.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

Document the key trade studies. Include all trade considerations, trade results, and the subsequent mission decision. Provide detailed reasoning of trade results and an assessment of the overall impact to the mission design.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV-to-Adapter Assembly and Integration Procedure	22
3. USE	**4. DATE**
To provide detailed instructions on the assembly and integration of the DV to Adapter.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

Shall contain detailed procedures for assembly and integration of DV to Adapter including, but not limited to:

Fasteners (types, torque values)
Fluid line connections
Electrical connections
Orientation
Special tools required
GSE required
Safety considerations
Cleanliness requirements
Grounding requirements

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DFRC Equipment & Facilities Required by DV, Adapter, and GSE	23
3. USE To define the critical equipment and facilities required to support the DV, Adapter, and Contractor-supplied GSE at DFRC	4. DATE January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

Shall provide a comprehensive list of DFRC facilities and equipment in support of DV, Adapter, and Contractor-supplied GSE at DFRC.

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV, Adapter, and FCE Verification and System Integration Plan	24
3. USE To define the activities necessary to integrate components and subsystems into the DV, Adapter, and FCE and provide a plan for verifying compliance with the Project's technical specifications.	4. DATE January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

Shall provide a comprehensive plan for the sequential workflow for the assembly, integration, and verification of all DV, Adapter, and FCE hardware and software.

Shall include the following:

a. Detailed flow diagrams with the correlated sequence of DV and Adapter integration, test, and calibration activities.

b. DV integration tests, calibrations, and other support activities that must be performed to mate with the Adapter.

c. Critical resources, facilities, personnel, and equipment.

d. Requirements for GSE, software, test equipment, and simulators to be used.

e. Safety requirements and special handling requirements during the life of the project.

Shall provide the complete verification approach for all hardware, software, and GSE, providing a comprehensive description of all test and analytical activities that support validating the DV, Adapter, FCE, and GSE and will satisfy the requirements in this SOW. This information shall be summarized in a comprehensive verification matrix that uses the following verification levels: Component, Subsystem, and Element (i.e. DV and Adapter). The approach shall include all design, analysis, development, interface, integration (including interface verification), safety, functional, performance, and calibration requirements, and shall specify the method and specific mechanism of verification (by analysis, test, inspection, demonstration, and similarity.) The plan shall give the rationale for retest determination. For each analysis, the plan shall include the objectives, mathematical model, quality checks, required output, and criteria for assessing acceptability of results.

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DATA REQUIREMENTS DESCRIPTION, CONTINUED

1. TITLE	4. DATE	2. NUMBER
DV, Adapter, and FCE Verification and System Integration Plan	January 30, 2003	24 (cont.)

9. PREPARATION INFORMATION

The plan shall include, either singularly or in combination, the following test categories: structural, mechanical, electrical, electromagnetic compatibility, thermal, pneumatic, and functional tests and calibration. For each test, the plan shall identify:

- Test article(s)
- Level of assembly and configuration
- Objective
- Environments, duration, cycles, and methods
- Performance test and instrumentation needs
- Equipment and instrumentation certification and calibration policies
  - Instrumentation calibration vs. integration level to satisfy overall system-level calibration requirement
  - X-43C security classification requirements
- Organizations involved, staffing and personnel responsibilities
- Flow diagram of the integrated test sequence
- Quality and safety activities
- Test methods and controls to be used
- Photographic or other special coverage required

This DRD does not imply a method packaging or a standard structure of the required data. The Contractor shall determine the most efficient method (a single document or multiple documents) to provide the required data.

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Test Procedures	25
3. USE	**4. DATE**
To describe the test preparations and test procedures to be used to perform testing of DV, Adapter, and FCE components, subsystems, and assemblies.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**
Test Reports (DRD-26)	

9. PREPARATION INFORMATION

Testing shall be controlled by written procedures with the level of detail and degree of documentation balanced against test complexity.

Submitted test procedures shall include:

- Cover sheet with test title and number
- Review and approval sign-off sheet
- Revision record sheet
- Table of contents
- Test scope, objective, success criteria, applicable documents, definitions, and abbreviations
- Personnel requirements
- Timing and sequence of events
- Description of test article, test equipment and instrumentation
- Description of safety/hazard conditions and how they are managed
- Test levels and profiles/duration or performance metrics
- Pass/fail criteria
- Handling/contamination control
- Pre-test preparation
- Certification/calibration
- Data and data acquisition requirements
- Analysis activity supporting test and GSE
- Step-by-step test procedure

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Test Reports	26
3. USE	**4. DATE**
To provide a record of the tests of DV, Adapter, and FCE components, subsystems, and assemblies	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**
Test Procedures (DRD-25)	

9. PREPARATION INFORMATION

All test activities shall be documented in a written and uniquely-numbered report following the testing for every major component, subsystem, and assembly of the DV, Adapter, and FCE. The report shall describe the degree to which the objectives were accomplished.

Test Reports shall include:

- Statement of test objectives and how well they were met
- Analysis conducted to support test activities
- Description of pending data analysis
- Summary of all non-conformance and failures that occurred
- Pictures, drawings and sketches used in conduct of test and in data reduction/analysis
- Data obtained during test
- Post-test status of test article, specifically any changes to test article as a result of test
- Description of pending actions/recommendations
- As-run test procedure

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Booster Interface Requirements and Description Document	27

3. USE	4. DATE
Provides the interface requirements and description to the Booster/Launch Services contractor for the development of the Adapter-to-Booster Interface Control Document (ICD). The Contractor shall provide this information with the understanding that the ICD is a mutually-developed document between the Contractor, Government and Booster/Launch Services contractor. The Contractor shall be bound by the final ICD upon approval by the Contractor, Government, and Booster/Launch Services contractor. ICD configuration management will be provided by the Government.	January 30, 2003
	5. PREPARED BY: X-43C Project Office
	6. APPROVED BY: Paul Moses Project Manager

7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

As a minimum, the following sections shall be included in the document:

- Booster Payload Questionnaire Response
- Structural Interface
  - Joint geometry
  - Fastener specifications
- Mechanical interface
  - Fluid systems
  - Connectors – type and number
- Thermal interface
  - Temperature limitations
  - Cooling medium flow definition
  - Insulation
  - Heat dissipation
- Electrical interface
  - Power – voltage and current
  - Signal (analog) – type, voltage, polarity, and range
  - Signal (digital) – type, voltage and polarity
- Data Interface
  - Bus type
  - Reference voltage (if applicable)
  - Data rate
  - Latency
  - Protocol

In addition, DV/Adapter pass-through fluid and electrical connections to the Booster or Carrier Aircraft shall be identified and specified.

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DATA REQUIREMENTS DESCRIPTION	
1. TITLE DV-to-Range Interface Requirements and Description Document.	2. NUMBER 28
3. USE Provides interface requirements and general interface description to the RTO for the development of the overall Project's Range Operation Directive (OD) agreement. The Contractor shall provide this information with the understanding that the Range OD is mutually developed document with the Contractor, Government, and Range. The Contractor shall be bound by the final OD upon approval by the Contractor, Government, and Range. OD configuration management will be provided by the Government.	4. DATE January 24, 2003 5. PREPARED BY: Kurt Detweiler Chief Engineer 6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

Shall describe the DV interface and any associated requirements with respect to the Range and Appendix 1

As a minimum, the following sections shall be included in the document:

- Flight Termination System
  - Cardioid Analysis
  - Implementation and design
- RF Utilization
- Telemetry interface
  - DV data flow (internal and external)
  - PCM frame format
  - Data format
  - PCM output
  - Telemetry output including rebroadcast
  - RF Link analysis and antenna pattern
- Tracking interface
  - Transmitter output
  - Receiver
  - RF Link analysis and antenna pattern

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Software Development Plan	29

3. USE	4. DATE
• To define the technical and managerial processes necessary to satisfy the project requirements. • To define the objectives, standards, and software life cycle models to be used in the software development process. • To define the objectives, standards, and procedures to be used in the software operation process • To define the objectives, standards, and procedures to be used in the software maintenance process.	February 4, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager

7. INTERRELATIONSHIP	8. REFERENCES
DRD 34 - Software Integration, Test, and Verification Plan DRD 38 - Software Status Report	

9. PREPARATION INFORMATION

The Contractor shall develop a software development plan which includes data specified in the following information item(s):

• Project Management Plan	IEEE/EIA 12207.1-1997, Section 6.11
• Development Process Plan	IEEE/EIA 12207.1-1997, Section 6.5
• Operation Process Plan	IEEE/EIA 12207.1-1997, Section 6.9
• Maintenance Process Plan	IEEE/EIA 12207.1-1997, Section 6.8
• Software Quality Assurance Plan	IEEE/EIA 12207.1-1997, Section 6.20
• Software Configuration Management Plan	IEEE/EIA 12207.1-1997, Section 6.14
• Software Development Standards Description	IEEE/EIA 12207.1-1997, Section 6.17

The Contractor shall also include the following:

- Software Metrics Management:
  Software metrics management to track and manage software cost, schedule, quality (defects), and size (auto and hand coded). The Contractor shall develop and maintain a metrics-tracking worksheet recording the planned, actual, and EAC, by reporting period, for the duration of the contract.
- Computer Resource Management:
  Computer Resource (CR) Management to track and manage CPU, Memory, Data Bus, and Communications Bandwidth utilization for the duration of the contract. The Contractor shall determine CR margins to be measured, maintained and adhered to by project phases. The Contractor shall plan computer resource margins to accommodate maintenance modifications, and in-flight operating margins. The Contractor shall develop and maintain a CR-tracking worksheet recording the planned, actual, and EAC (both measurements and margins) by reporting period, for the duration of the contract.

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DATA REQUIREMENTS DESCRIPTION, CONTINUED

1. TITLE	4. DATE	2. NUMBER
Software Development Plan	February 4, 2003	29

9. PREPARATION INFORMATION

- Technology Management:
  To provide a stable and repeatable development environment for the duration of the ARES project, the Contractor shall develop and maintain a Technology Baseline (a list or table) documenting all SW tools that the Contractor will use for the development, maintenance, and operations of C&DH software (and associated GSE/GTE). For each item, the technology baseline shall record, tool name, specific purpose(s), vendor, version number, cost, and licensing /use restrictions. In the event of upgrades, replacements, or other changes, the Contractor shall modify the technology baseline, and notify Flight SW Manager of the reasoning, impacts, and cost at the next SW Status Meeting.
- Model and Simulation Management:
  To track and manage the Development, Testing, Delivery, Maintenance, and Reconciliation of Models and Simulations between the Contractor and Government Test Organizations. The Contractor shall develop and maintain a Model/Simulation Baseline (a list or table) documenting the most current version of Model/Simulation is in use at the Contractor's Facility and having been released for use by the Government Test Organizations. For each item, the Model/Simulation baseline shall record, Model/Simulation name, version number, release date, security classification, and licensing /use restrictions. In the event of new releases, refinements, modifications, or other changes, the Contractor shall modify the model/simulation baseline, and notify Flight SW Manager of the reasoning and potential impacts at the next SW Status Meeting.

This DRD does not imply a method packaging or a standard structure of the required data. The Contractor format is acceptable for the document(s). The Contractor shall determine the most efficient method (a single document or multiple documents) to provide the required data.

Distribution shall be as follows:
Contractor's Software Data Distribution System (DDS), One electronic copy.

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Software Requirements Description	30
3. USE To specify the requirements for a software item and the methods to be used to ensure that each requirement has been met. Used as the basis for design and verification testing of a software item.	4. DATE February 4, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP DRD 29 - Software Development Plan DRD 34 - Software Integration, Test, and Verification Plan DRD 38 - Software Status Report	8. REFERENCES

9. PREPARATION INFORMATION

The Contractor shall include data specified in the following information item(s):

• Software Requirements Description	IEEE/EIA 12207.1-1997, Section 6.22

This DRD does not imply a method packaging or a standard structure of the required data. The Contractor format is acceptable for the document(s). The Contractor shall determine the most efficient method (a single document or multiple documents) to provide the required data.

Distribution shall be as follows:
Contractor's Software Data Distribution System (DDS), One electronic copy.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Software Architecture Description	31
3. USE To describe the software item wide design decisions and the software item architectural design.	4. DATE February 4, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP DRD 29 Software Development Plan DRD 34 Software Integration, Test, and Verification Plan DRD 38 Software Status Report	8. REFERENCES

9. PREPARATION INFORMATION

The Contractor shall include data specified in the following information item(s):

• Software Architecture Description	IEEE/EIA 12207.1-1997, Section 6.12

This DRD does not imply a method packaging or a standard structure of the required data. The Contractor format is acceptable for the document(s). The Contractor shall determine the most efficient method (a single document or multiple documents) to provide the required data.

Distribution shall be as follows:
Contractor's Software Data Distribution System (DDS), One electronic copy.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Software Design Description	32

3. USE	4. DATE
To describe the design of a software item. (The software design description and the software architecture provide the detailed design needed to implement the software.) May be supplemented by software item interface design.	February 4, 2003
	5. PREPARED BY: David Haakenson, Flight SW Manager
	6. APPROVED BY: Paul Moses, Project Manager

7. INTERRELATIONSHIP	8. REFERENCES
DRD 29 Software Development Plan DRD 34 Software Integration, Test, and Verification Plan DRD 38 Software Status Report	

9. PREPARATION INFORMATION

The Contractor shall include data specified in the following information item(s):

• Software Design Description	IEEE/EIA 12207.1-1997, Section 6.16

This DRD does not imply a method packaging or a standard structure of the required data. The Contractor format is acceptable for the document(s). The Contractor shall determine the most efficient method (a single document or multiple documents) to provide the required data.

Distribution shall be as follows:
Contractor's Software Data Distribution System (DDS), One electronic copy.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Software Interface Design Description	33

3. USE	4. DATE
To describe the software interface characteristics of one or more systems, subsystems, hardware items, software items, manual operations, or other system components.	February 4, 20033
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager

7. INTERRELATIONSHIP	8. REFERENCES
DRD 29 Software Development Plan DRD 34 Software Integration, Test, and Verification Plan DRD 38 Software Status Report	

9. PREPARATION INFORMATION

The Contractor shall include data specified in the following information item(s):

• Software Interface Design Description	IEEE/EIA 12207.1-1997, Section 6.19

The Contractor shall also include the following:

- Indicate and describe signal conditioning for interface parameters.

This DRD does not imply a method packaging or a standard structure of the required data. The Contractor format is acceptable for the document(s). The Contractor shall determine the most efficient method (a single document or multiple documents) to provide the required data.

Distribution shall be as follows:
Contractor's Software Data Distribution System (DDS), One electronic copy.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Software Integration, Test, and Verification Plan	34

3. USE	4. DATE
• To define the activities necessary to integrate the software units and software components into the software item. • To plan the activities for testing of software items and software systems. • To describe the software test environment to be used for the testing, identify the tests to be performed, and provide schedules for test activities.	February 4, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager

7. INTERRELATIONSHIP	8. REFERENCES
DRD 29 Software Development Plan DRD 38 Software Status Report	

9. PREPARATION INFORMATION

The Contractor shall include data specified in the following information item(s):

• Software Integration Plan	IEEE/EIA 12207.1-1997, Section 6.18
• Test or Validation Plan	IEEE/EIA 12207.1-1997, Section 6.27

The Contractor shall also include the following:

- SW Verification Test Matrix

This DRD does not imply a method packaging or a standard structure of the required data. The Contractor format is acceptable for the document(s). The Contractor shall determine the most efficient method (a single document or multiple documents) to provide the required data.

Distribution shall be as follows:
Contractor's Software Data Distribution System (DDS), One electronic copy.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Software Verification Test Procedures	35

7. USE	4. DATE
To describe the test preparations, test cases, and test procedures to be used to perform verification testing of a software item or a software system or subsystem.	February 4, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager

7. INTERRELATIONSHIP	8. REFERENCES
DRD 29 Software Development Plan DRD 34 Software Integration, Test, and Verification Plan DRD 38 Software Status Report	

9. PREPARATION INFORMATION

The Contractor shall include data specified in the following information item(s):

• Test or Validation Procedures	IEEE/EIA 12207.1-1997, Section 6.28

This DRD does not imply a method packaging or a standard structure of the required data. The Contractor format is acceptable for the document(s). The Contractor shall determine the most efficient method (a single document or multiple documents) to provide the required data.

Distribution shall be as follows:
Contractor's Software Data Distribution System (DDS), One electronic copy.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Software Verification Test Results Report	36

3. USE	4. DATE
To provide a record of the verification performed on a software item, a software system or subsystem, or other software related item.	February 4, 2003
	5. PREPARED BY: David Haakenson, Flight SW Manager
	6. APPROVED BY: Paul Moses, Project Manager

7. INTERRELATIONSHIP	8. REFERENCES
DRD 29 Software Development Plan DRD 34 Software Integration, Test, and Verification Plan DRD 38 Software Status Report	

9. PREPARATION INFORMATION

The Contractor shall include data specified in the following information item(s):

• Software Verification Results	IEEE/EIA 12207.1-1997, Section 6.29

This DRD does not imply a method packaging or a standard structure of the required data. The Contractor format is acceptable for the document(s). The Contractor shall determine the most efficient method (a single document or multiple documents) to provide the required data.

Distribution shall be as follows:
Contractor's Software Data Distribution System (DDS), One electronic copy.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Software Validation Recommendations	37

3. USE	4. DATE
• To provide a review the Validation Test Plans and Procedures, • To identify areas of potential risk to the vehicle or it's components.	January 23, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager

7. INTERRELATIONSHIP	8. REFERENCES
DRD 29 Software Development Plan DRD 34 Software Integration, Test, and Verification Plan DRD 38 Software Status Report	

9. PREPARATION INFORMATION

The Contractor shall include, but is not limited to, comments and recommendations on:

- Validation testing approach,
- Validation test coverage,
- Validation test activities which risk invalidating previous software quality assurance activities or tests,
- Validation tests activities with the potential risk for DV damage.

Distribution shall be as follows:
Contractor's Software Data Distribution System (DDS), One electronic copy.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Software Status Report	38
3. USE Provides a monthly report on Contractor software activities and progress towards project objectives.	4. DATE February 4, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP DRD 29 Software Development Plan DRD 34 Software Integration, Test, and Verification Plan	8. REFERENCES

9. PREPARATION INFORMATION

The Software Status Report shall include, but is not limited to:

Schedule/WBS Status

- Milestones achieved
- Progress toward near-term milestones
- Achievements to be completed during the next reporting period
- Critical Path Analysis

Summary of problems encountered, including

- Failure reports
- Corrective actions planned/taken
- Closure summaries

Software Metrics Management Status (include/attach Metrics Tracking Worksheet)
Computer Resource Management Status (include/attach CR Tracking Worksheet)
Technology Management Status (include/attach Technology Baseline)
Model and Simulation Management Status (include/attach Model/Simulation Baseline)
Risk Management Status
DDS Status

- Summary of New, Modified, and Deleted data items.

Updated Software Development Plan
Updated Software Integration, Test, and Verification Plan

Distribution shall be as follows:
Contractor's Software Data Distribution System (DDS), One electronic copy.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV Separation Development Plan	39
3. USE Insight into the design and verification approach for the DV separation from the LV during the Separation Phase.	4. DATE January 24, 2003
	5. PREPARED BY: Kyong Lim, GNC&T LSSE
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP DV, Adapter, and FCE Verification and System Integration Plan, DRD-24	8. REFERENCES

9. PREPARATION INFORMATION

Shall provide a comprehensive plan addressing the following:

- Detailed development schedule
  - Mechanism hardware design
  - Separation Simulation
  - Contractor aero model development inputs and corresponding GFI delivery requirement
- LV separation interface requirements
- Verification plan, including the following:
  - Separation reference coordinate frame definition
  - Identification of interdependencies with respect to the Government-developed separation aero model
  - Separation simulation modeling definition and approach
    - Mechanism modeling
    - Aerodynamic modeling
    - Modeling tool selection
    - Controller selection for improving separation performance
    - Uncertainties during separation
    - Re-contact and interference analysis
    - Vehicle state reporting

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV Emulator Definition	40
3. USE To support VSD development, describe the architectural design and concept of operation of the DV Emulator	4. DATE February 18, 2003
	5. PREPARED BY: Kurt Detweiler Chief Engineer
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP DV Emulator Documentation (DRD-43) DV Emulator Core Components Documentation (DRD-44) Model Description Documentation (DRD-46)	8. REFERENCES

9. PREPARATION INFORMATION

The Contractor shall provide the following data:

- DV Emulator Overview and Identification
- Concept of Operation
- Architectural Description
  - Identification of Interface Control Documentation
- Hardware Item Identification
- Software Item Identification
- Manual Operations identification
- Rationale for allocation of HW items, SW items, and manual operations
- GSE Interface Description
- Integration strategy with government-developed Hardware Interface Unit (HIU)
- Strategy for subsystem isolation and/or extraction for testing
- Strategy for updates and configuration control for contract duration
- Emulator Packaging Strategy

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Flight Software	41

3. USE	4. DATE
• To provide all software instructions developed in order to implement the design of a software item. To provide any instructions for generating the object code from the source code and for linking and loading the data. • To provide the transformed version of source code (executable object code) that is directly usable by the central processing unit of the target computer and is, therefore, the software that is loaded into the hardware or system. .	February 4, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager

7. INTERRELATIONSHIP	8. REFERENCES
DRD 29 Software Development Plan DRD 34 Software Integration, Test, and Verification Plan DRD 38 Software Status Report	

9. PREPARATION INFORMATION

The Contractor shall include data specified in the following information item(s):

• Source Code Record	IEEE/EIA 12207.1-1997, Section 6.24
• Executable Object Code Record	IEEE/EIA 12207.1-1997, Section 6.7

Distribution shall be as follows:
Contractor's Software Data Distribution System (DDS), One electronic copy.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Software Data Distribution System (DDS) Listing	42

3. USE	4. DATE
For the coordination of Software and Data Product changes between the Contractor and impacted project partners to ensure project-wide consistency and stability of the X-43C SW development environment	February 4, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager

7. INTERRELATIONSHIP	8. REFERENCES
Software Development Plan (DRD 29) Software Integration, Test, and Verification Plan (DRD 34) Software Status Report (DRD 38)	

9. PREPARATION INFORMATION

The DDS Listing (list or table) shall document all data and computer software stored on the DDS.

For each item posted to the DDS, the DDS Listing shall identify, but is not limited to, the identification number, title that shall describe content, security classification, and in-house release date.

The list shall be kept current as data items are generated.

Distribution shall be as follows:
Contractor's Software Data Distribution System (DDS), One electronic copy.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV Emulator Documentation	43
3. USE Provides cognizance of the DV Emulator design data and functional characteristics required to develop the VSD validation test stand and validation test procedures.	4. DATE January 30, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

For the DV Emulator and its components, the Contractor shall deliver, but is not limited to, the following:

- As-Built Drawing (*Electrical, Mechanical*) (and As-Delivered, if different)
- As-Built Parts and Materials List (and As-Delivered, if different)
- Component Interface Control Document/Interface Design Description
- Known Anomalies
- Limited-life Articles
- Safety Documentation
- Calibration Data
- Training documentation
- Verification report
- Check cases and results

Submission of deliverables shall be as follows:

Contracting Officer (CO)	Cover Letter Only
Contracting Technical Representative (COTR)	Cover Letter Only
X-43C Chief Engineer	E-Copy Only
X-43C Software Manager	E-Copy Only
X-43C VSD Lead Subsystems Engineer	E-Copy
Contractor's Software Data Distribution System (DDS)	E-Copy for Archival

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV Emulator Core Components Documentation	44
3. USE Provides cognizance of the DV Emulator Core Components design data and functional characteristics required to develop the VSD validation test stand and validation test procedures.	4. DATE January 16, 2003
	5. PREPARED BY: Haakenson/Detweiler
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

For the DV Emulator Core Components, the Contractor shall deliver, but is not limited to, the following:

For Hardware:

- as-built drawing (electrical, mechanical) (and as-delivered, if different)
- as-built parts and materials list (and as-delivered, if different)
- component interface control document / interface design description
- DV to GSE interface control document / interface design description
- software and development environment (software tools and documentation)
- known anomalies
- limited life articles
- safety documentation
- calibration data
- training documentation
- verification reports (if any)

For Software:

- incremental software builds (source and executable) in accordance with the Contractor's Software Development Plan and schedule
- check cases and results (If any)

Submission of deliverables shall be as follows:

Contracting Officer (CO)	Cover Letter Only
Contracting Technical Representative (COTR)	Cover Letter Only
X-43C Chief Engineer	E-Copy Only
X-43C Software Manager	E-Copy Only
X-43C VSD Lead Subsystems Engineer	E-Copy Only
Contractor's Software Data Distribution System (DDS)	E-Copy for Archival

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV Controller Design Description Document	45
3. USE Insight into the controller design approach and model selection	4. DATE January 24, 2003
	5. PREPARED BY: Kyong Lim, GNC&T LSSE
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP Model Description Documentation (DRD-46) PS Analytical Model (DRD-57)	8. REFERENCES

9. PREPARATION INFORMATION

Shall provide and maintain an overall description of the DV controller design.

Shall describe rationale for selection of and provide technical documentation for all disturbance models, DV dynamical model, uncertainty models, and any other models used for the flight controller design approach.

Shall specifically address the approaches taken and models to be used with respect to the following issues:

- optimal guidance approach
- robustness in trajectory tracking and attitude stability
- control law switching across different flight phases
- uncertainties in the unsteady aerodynamics during separation transients
- effective and reliable control architecture/interface between the Propulsion control system and the primary DV flight control system
- flight control design approach that can best mitigate the effects of disturbances associated with off-nominal engine operations including engine un-start, flameout, and restart.

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Model Description Documentation	46
3. USE	**4. DATE**
Provides cognizance of the design data and functional characteristics required to complete development of the VSD validation test stand and validation test procedures.	January 30, 2003
	5. PREPARED BY: David Haakenson, Flight SW Manager
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

For each model, the Contractor shall deliver, but is not limited to, the following:

- Description of the model,
- Interface definition descriptions,
- Check cases with stand alone input driver module (wrapper),
- Code, and
- Block diagrams.

The Contractor shall deliver, but is not limited to, the following models:

- Aero model
- Atmospheric model
- Actuation System model
- Flight controls, guidance, and navigation model(s)
- Engine performance model
- Complete, vehicle-level, installed aero/propulsive model
- Engine control laws
- Fuel/fluids model
- Sensors model(s)
- Mass properties model
- Hinge moments model(s)
- Separation logic sequencing model
- System Moding Logic
- Structural model
- Disturbance model
- Turbulence model
- Separation transient model

Submission of deliverables shall be as follows:

Contracting Officer (CO)	Cover Letter Only
Contracting Technical Representative (COTR)	Cover Letter Only
X-43C Chief Engineer	E-Copy Only
X-43C Software Manager	E-Copy Only
X-43C VSD Lead Subsystems Engineer	E-Copy Only
Contractor's Software Data Distribution System (DDS)	E-Copy for Archival

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Reference Trajectory	47
3. USE To define the flight operational envelope from Separation through Descent Phases for use in DV and Mission design, planning, and analysis.	**4. DATE** January 30, 2003
	5. PREPARED BY: Ken Rock Propulsion LSSE
	6. APPROVED BY: Paul L. Moses Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

The Government will provide an initial reference trajectory, X43C-GFI-006, DV Conceptual Design Trajectory Definitions.

The Contractor shall develop and maintain a reference trajectory including the 3-sigma Monte Carlo derived flight operational envelope to include the following:

- Trajectory narrative description
- Reference data inputs (for each trajectory phase)
- Performance target identification against results
- Resulting trajectory database results
- Issue identification and resolution plan

This document will be placed under configuration control.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Separation Simulation	48
3. USE Provides cognizance of the design data and functional characteristics required to complete development of the VSD validation test stand and validation test procedures.	4. DATE January 30, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

The Contractor shall supply and maintain a separation (DV from Adapter) simulation. The simulation shall be capable batch mode processing.

For each updated version of the simulation delivered, the Contractor shall deliver, but is not limited to, the following:

- Description of the simulation,
- Interface definition descriptions,
- Check cases with stand alone input driver module (wrapper),
- Code
- Block diagrams.

Submission of deliverables shall be as follows:

Contracting Officer (CO):	Cover Letter Only
Contracting Technical Representative (COTR):	Cover Letter Only
X-43C Software Manager:	E-Copy Only
Contractor's Software Data Distribution System (DDS):	E-Copy for Archival

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV Simulation	49
3. USE Provides cognizance of the design data and functional characteristics required to complete development of the VSD validation test stand and validation test procedures.	4. DATE January 30, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

The Contractor shall supply and maintain an all-software DV mission simulation (DV SIM). The simulation shall be capable of real-time operation as well as batch mode processing.

For each updated version of a simulation delivered, the Contractor shall deliver, but is not limited to, the following:

- Description of the simulation,
- Interface definition descriptions,
- End-to-end check cases with stand alone input driver module (wrapper),
- Code
- Block diagrams.

Submission of deliverables shall be as follows:

Contracting Officer (CO):	Cover Letter Only
Contracting Technical Representative (COTR):	Cover Letter Only
X-43C Software Manager:	E-Copy Only
Contractor's Software Data Distribution System (DDS):	E-Copy for Archival

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Simulation Reconciliation Report	50

3. USE	4. DATE
To record the results of the model/simulation reconciliation of the Contractor's Simulation Environment and the Government's Validation Testing Simulation Environment.	January 30, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager

7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

The Contractor shall report on, but is not limited to, the following:

- Results of end-to-end check cases run on both Government and Contractor DV simulations
- Discrepancies identified between Contractor simulation and the Government simulation
- Analysis to identify root causes of the discrepancies,
- Actions and effectiveness in reducing the discrepancies,
- Recommendations, if required, to further reduce remaining discrepancies.
- Risk Management

Submission of deliverables shall be as follows:

Contracting Officer (CO):	Cover Letter Only
Contracting Technical Representative (COTR):	Cover Letter Only
X-43C Software Manager:	E-Copy
Flight Test Chief Engineer	E-Copy
Contractor's Software Data Distribution System (DDS):	E-Copy for Archival

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Validation Recommendations	51

3. USE	4. DATE
To provide a review of the Government's Validation Test Plans and Procedures in order to identify areas of potential risk to the vehicle or it's components. To plan the support activities after the DV is delivered to the RTO in order to support system integration and test through flight test operation	January 30, 2003
	5. PREPARED BY: David Haakenson Flight SW Manager
	6. APPROVED BY: Paul Moses Project Manager

7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

The Contractor shall include, but is not limited to, comments and recommendations on:

- Validation testing approach,
- Validation test coverage,
- Validation test activities which risk invalidating previous quality assurance activities or tests,
- Validation tests activities with the potential risk for DV damage.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Post-Flight Test Evaluation	52
3. USE	4. DATE
Provides a report on the progress towards project objectives.	January 30, 2003
	5. PREPARED BY: David Haakenson, Flight SW Manager
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

The Contractor shall include, but is not limited to:

An evaluation that describes the degree to which the objectives were accomplished, how well the mathematical models were validated, and the performance where applicable.

Test Evaluations shall include:

- Statement of test objectives and how well they were met
- Analysis conducted to support test activities
- Description of pending data analysis
- Summary of all non-conformance and failures that occurred
- Pictures, drawings and sketches used in conduct of test and in data reduction/analysis
- Data obtained during test
- Description of pending actions/recommendations
- As-run test procedure
- Lessons Learned
- Recommendations for next Flight Test

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Structural Loads Development Plan	53

3. USE	4. DATE
The Structural Loads Development Plan explains the development approach for final DV and Adapter mechanical and thermal loads definition for use in design and test.	January 30, 2003
	5. PREPARED BY: Kurt N. Detweiler, Chief Engineer
	6. APPROVED BY: Paul L. Moses, Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

Shall contain a detailed development approach for mechanical and thermal loads definition using Contractor-developed and Government-provided aerodynamics data. Plan should include approach for load definition/cases during Ground Test, Pre-flight, Captive Carry, Drop/Boost, Separation, Coast, Engine Test, Descent, and RTB mission phases. Approach shall include discussions of nominal and off-nominal conditions, including statistical variation.

Thermal loads approach shall address airframe-imposed aerothermal induced heat flux definition along the flight trajectory, specialized critical load areas such as corner effects, load amplification, shock-shock interactions and shock impingements, internal component induced loads and any additional effects the Contractor identifies as critical. Methods used to address specific heating phenomena imposed on the airframe shall be specifically delineated over the design maturity timeline.

Mechanical loads approach shall address airframe internal induced loads and external ground handling, aerodynamic, inertial, and shock loads and any additional effects the Contractor identifies as critical. Analysis and modeling approach to loads development and stress analysis shall be addressed over the design maturity timeline.

Plan shall include discussions on thermal and mechanical load case interaction approach.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Structural Loads Definition Document	54
3. USE Defines mechanical and thermal design loads and associated load cases for the DV and Adapter design development	**4. DATE** January 30, 2003
	5. PREPARED BY: Kurt N. Detweiler Chief Engineer
	6. APPROVED BY: Paul L. Moses Project Manager
7. INTERRELATIONSHIP Structural Loads Development Plan (DRD-53)	**8. REFERENCES**

9. PREPARATION INFORMATION

Mechanical and thermal loads shall be provided in a mission phase-delineated timeline.

Load cases definition shall be defined as combinations of mechanical/thermal loads provided in a mission phase-delineated timeline.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
DV/Adapter Structural and Thermal FEA Models	55

3. USE	4. DATE
Structural and thermal analysis models will be used to verify compliance with design margin requirements. Specific combined DV/Adapter FEM will be used and integrated with the Booster FEA model for overall Launch Vehicle verification.	January 24, 2003
	5. PREPARED BY: Regina Spellman, Structure LSSE
	6. APPROVED BY: Paul Moses Project Manager

7. INTERRELATIONSHIP	8. REFERENCES
Technical Status Reports (DRD-2) End Item Data Package (DRD-18) Project Review Package (DRD-19)	

9. PREPARATION INFORMATION

The following is a minimum set** of models required:

- DV/Adapter (i.e. short stack) bending frequency***
- DV/Adapter structural loads
- DV/Adapter structural FEA
- Detail models:
  - Fuel tank analysis model
  - Control surface FEA
  - Engine mounts detailed FEA
  - Interior compartment thermal analysis
  - Hot structure thermal analysis

**Some FEMs may not be explicitly required if global models contain sufficient fidelity and/or appropriate closed form solutions are utilized. If certain models are eliminated, sufficient documentation of the justification must be provided.
***FEA model coarseness and interface definition must be coordinated with the Government to assure compatibility with existing booster models

Each analysis delivery shall include:

- NASTRAN model
- Description of model contents including as applicable material data, mass properties reference, gauge thickness,
- Load and boundary condition descriptions

Results summary including tabulation of applicable design margins

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
PS Performance and Operability Characterization Plan	56

3. USE	4. DATE
To identify a complete set of parameters that govern performance and operability of the PS	January 30, 2003
	5. PREPARED BY: Ken Rock, Propulsion LSSE
	6. APPROVED BY: Paul L. Moses, Project Manager

7. INTERRELATIONSHIP	8. REFERENCES
PS Analytical Model (DRD 57)	

9. PREPARATION INFORMATION

Identify complete set of parameters that govern performance and operability of the PS inclusive of all ECU I/O parameters

Provide definitions for each parameter

Identify how each parameter will be quantified (test, analysis, etc.)

Provide definitions for operability and/or performance margin for each parameter

Identify how operability and/or performance margin will be quantified for each parameter

Identify if the parameter is an independent or dependant parameter in the PS Analytical Model

For each parameter:

1. Provide approach to determining uncertainty levels
2. Provide initial estimate of uncertainty levels (updated as necessary)

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
PS Analytical Model	57
3. USE A complete model of performance and operability of the PS.	4. DATE January 30, 2003
	5. PREPARED BY: Ken Rock Propulsion LSSE
	6. APPROVED BY: Paul L. Moses Project Manager
7. INTERRELATIONSHIP PS Performance and Operability Characterization Plan (DRD-56) Model Description Documentation (DRD-46) PS Monte Carlo Analysis (DRD-58)	8. REFERENCES

9. PREPARATION INFORMATION

The Model shall include the following:

- Aspects of PS operation and performance inclusive of ECU I/O and Control Laws, Flowpath, ES, FDS, SAS, Cowl Actuation, sensors, and all other pertinent subsystems and components.
- Computation of performance and/or operability margin for each parameter identified in DRD-56.
- Any effects that the PS has on DV operation and performance.
  - Thermal and pressure loads
  - Forces and Moments
  - Power utilization
  - Fuel utilization
  - Other commodities utilization, e.g. N2 purge
- Dynamic modeling of events which affect DV performance and operability including,but not limited to, the following:
  - cowl flap actuation
  - engine start (including SAS and FDS transients)
  - fuel injection site transition
  - shutdown transients
- As a minimum, PS operation in the Coast, Engine Test, and Descent Phases and other phases as required
- The capability to perform Monte Carlo analysis on all independent parameters identified in DRD-56.

The Model shall be maintained/updated as necessary.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
PS Monte Carlo Analysis	58
3. USE A 3-sigma Monte-Carlo analysis performed on a complete model of performance and operability of the PS.	**4. DATE** January 30, 2003
	5. PREPARED BY: Ken Rock Propulsion LSSE
	6. APPROVED BY: Paul L. Moses Project Manager
7. INTERRELATIONSHIP PS Analytical Model (DRD-57)	**8. REFERENCES**

9. PREPARATION INFORMATION

Contractor shall perform, document, and deliver a PS Analytical Model Monte-Carlo Analysis.

Analysis shall be maintained/updated as PS Analytical Model matures

Analysis shall include 3-sigma variation on all Monte-Carlo parameters.

Results shall include documentation of all parameter uncertainty levels and distributions.

Results shall include quantification of all performance and operability margins.

Scenarios that result in non-positive design margins shall be identified and reported; and a reconciliation plan developed.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
PS Cleanliness and Contamination Control Plan	59
3. USE To identify the cleanliness and contamination requirements necessary to assure successful operation of the PS.	**4. DATE** January 30, 2003
	5. PREPARED BY: Ken Rock Propulsion LSSE
	6. APPROVED BY: Paul L. Moses Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

The Contractor shall develop and report all cleanliness and contamination requirements from fabrication through assembly and flight testing.

The Contractor shall develop special procedures required to meet the cleanliness and contamination requirements.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
PS Design Criteria	60
3. USE To define the Design Criteria and positive design margins for the PS including specification of design factors of safety and load factors.	4. DATE January 30, 2003
	5. PREPARED BY: Ken Rock Propulsion LSSE
	6. APPROVED BY: Paul L. Moses Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

The Contractor shall provide documentation for the following:

- The PS Design Criteria shall include, but not be limited to, the following:
  - Structural
  - Thermal
  - Acoustic
  - Vibration
  - High and low cycle fatigue
  - Creep
  - Service life
  - Load Factors
  - Design Factors
  - Factors of Safety
- How all load factors, design factors, and factors of safety are applied and how design margin is quantified
- All critical load cases used in the design process
- How critical load cases were computed and verified
- Design margin in all cases

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
PS Operational Envelope	61
3. USE To define the operational envelope of the PS for use in DV and Mission design, planning, and analysis.	**4. DATE** January 30, 2003
	5. PREPARED BY: Ken Rock Propulsion LSSE
	6. APPROVED BY: Paul L. Moses Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

The Contractor shall define the PS Operating Envelope for Engine Test Phase (powered) and for Coast/Descent Phases (inlet-open/unpowered).

Performance and Operability Margins shall be quantified over the entire PS Operating Envelope.

The Contractor shall identify and report areas of the PS Operational Envelope that result in non-Positive performance and/or operability margin.

Engine re-light shall be evaluated over the entire PS Operating Envelope.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
FCE Software Documentation	62
3. USE	4. DATE
To support FCE testing in 8-Ft. HTT	January 30, 2003
	5. PREPARED BY: Ken Rock, Propulsion LSSE
	6. APPROVED BY: Paul L. Moses, Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

The Contractor shall supply and maintain an ECU Software Load to support FCE Testing in the 8-Ft HTT.

A Software Description Document shall be developed.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
FCE-to-8-Ft. HTT Interface Control Document	63
3. USE	**4. DATE**
To define the interfaces between the FCE/GSE and the 8-Ft. HTT.	January 30, 2003
	5. PREPARED BY: Ken Rock, Propulsion LSSE
	6. APPROVED BY: Paul L. Moses, Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

Shall describe the FCE and its GSE interface requirements with the 8-Ft. HTT.

As a minimum, the following sections shall be included in the ICD:

Structural interface
Mechanical interface
Fluid interface
Thermal interface
Electrical interface
Data interface

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DATA REQUIREMENTS DESCRIPTION	
1. TITLE FCE and GSE Operational Procedures	2. NUMBER 64
3. USE Provides the information necessary to operate the FCE and its GSE.	4. DATE January 30, 2003
	5. PREPARED BY: Ken Rock Propulsion LSSE
	6. APPROVED BY: Paul L. Moses Project Manager
7. INTERRELATIONSHIP	8. REFERENCES

9. PREPARATION INFORMATION

Shall contain a complete, detailed description of the operational procedures for the FCE and GSE systems during 8-Ft. HTT testing.

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
FCE Model Systems Report	65
3. USE	**4. DATE**
To meet the requirements of LAPG 1710.15, Model Systems Criteria Handbook	January 30, 2003
	5. PREPARED BY: Ken Rock Propulsion LSSE
	6. APPROVED BY: Paul L. Moses Project Manager
7. INTERRELATIONSHIP	**8. REFERENCES**

9. PREPARATION INFORMATION

See in instructions in LAPG 1710.15, Model Systems Criteria Handbook

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DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Verification Reports	66
3. USE	4. DATE
Provides a record of the verification of DV, Adapter, and FCE components, subsystems, and assemblies	February 18, 2003
	5. PREPARED BY: Kurt Detweiler, Chief Engineer
	6. APPROVED BY: Paul Moses, Project Manager
7. INTERRELATIONSHIP	8. REFERENCES
DV, Adapter, and FCE Verification and System Integration Plan (DRD-24) Test Reports (DRD-26) Project Review Packages (DRD-19)	

9. PREPARATION INFORMATION

All verification activities shall be documented in a written and uniquely-numbered report following the verification for every major component, subsystem, and assembly of the DV, Adapter, and FCE. The report shall describe the degree to which the verification was accomplished including identified verification methodology and level described in the Verification Matrix.

Verification reports shall include:

- Statement of verification objectives and how well they were met
  - Include presentation of respective Verification Matrix data
- Test and analysis reports to support verification compliance
- Description of any outstanding analysis
- Summary of all related non-conformance issues
- Description of pending actions/recommendations

DATA REQUIREMENTS DESCRIPTION

1. TITLE	2. NUMBER
Integrated Aero/Propulsion Model Methodology and Plan	67
3. USE To provide the methodology and plan for developing the complete, vehicle level, installed aero/propulsive performance model for the DV in the cowl-closed/unpowered, cowl-open/unpowered, and cowl-open/powered configurations.	4. DATE February 19, 2003
	5. PREPARED BY: Ken Rock Propulsion LSSE
	6. APPROVED BY: Paul L. Moses Project Manager
7. INTERRELATIONSHIP Model Description Document (DRD-46) PS Analytical Model (DRD-57)	8. REFERENCES

9. PREPARATION INFORMATION

Identify the methodology for developing the complete, vehicle-level, installed aero/propulsive performance model for the DV in the cowl-closed/unpowered, cowl-open/unpowered, and cowl-open/powered configurations including transition between configurations.

The description of the methodology should include, but is not limited to the following:

- Force accounting system
- Identification of all database components required for the complete model
- Approach to quantifying each database component, e.g. analytical, computational, or experimental.
- Database build-up and integration methodology
- Approach for quantifying uncertainty for the complete integrated model
- Verification approach for each database component and completed integrated model

Identify the format and input and output for each database component and for the complete integrated model.

Identify the plan and schedule for the databases and model development and verification, including any plans for incremental development.